

REMARKS

The Applicants sincerely appreciate the thorough examination of the present application as evidenced by the Office Action of June 1, 2005. In particular, Applicants appreciate the Examiner's allowance of Claims 35-38 and indication that Claims 15-23, 25, and 28-33 would be allowable if rewritten in independent form. In response, Applicants have amended Claims 15, 21, 23, 25, and 29 to include all recitations of Claim 14 and have amended Claim 28 to include all recitations of Claims 14 and 27 thereby placing Claims 15-23, 25, and 28-33 in a condition indicated allowable by the Examiner. The Applicants have also amended Claim 29 to recite "on exposed surfaces of the second ~~insulating layer~~ electrode", thereby correcting a minor error noted therein.

The Applicants have also amended Claims 14 and 24 to more clearly define the claimed invention. In the following remarks, the Applicants will show that Claims 14 and 24 are patentable over the cited art. A Notice of Allowance is thus respectfully requested in due course.

Independent Claim 14 Is Patentable Over Lowrey

Claim 14 has been rejected under 35 U.S.C. Sec. 102(e) as being anticipated by U.S. Patent No. 6,586,761 to Lowrey et al. (hereinafter "Lowrey"). The Applicants respectfully submit, however, that Claim 14 is patentable over Lowrey for at least the reasons discussed below.

As amended, Claim 14 recites a method of forming a phase-changeable memory device including:

- forming an insulating layer on a substrate, the insulating layer having a hole therein;
- after forming the insulating layer, forming a first electrode in the hole in the insulating layer;
- forming a pattern of a phase-changeable material on the first electrode; and
- forming a second electrode on the layer of the phase-changeable material such that the pattern of the phase-changeable material is between the first and second electrodes, wherein portions of the second electrode extend beyond an edge of the pattern of phase-changeable material.

In support of the rejection of Claim 14, the Examiner states that Lowrey discloses:

steps of forming an insulating layer (16), forming a first electrode (14) in the hole in the insulating layer, forming a pattern of a phase-changeable material (18) on the first electrode, and forming a second electrode (26 and 28) on the layer of the phase-changeable material in which portions of the second electrode extend beyond an edge of the pattern of phase-changeable material.

Claim 14 has been amended to include the following language “after forming the insulating layer” to clarify that the formation of the pattern of phase-changeable material on the first electrode occurs after the insulating layer is formed. Lowrey, however, does not disclose “after forming the insulating layer, forming a first electrode in the hole in the insulating layer”. In contrast, Lowrey in the Detailed Description discloses:

A technique for forming the memory cells 10, according to one embodiment, may involve initially forming the lower electrodes 14 on a substrate 12 using conventional patterning and deposition techniques, as shown in FIG. 4. [...]

The insulator 16 may then be deposited over the patterned lower electrodes 14. (underline added.)

Lowrey, col. 2, lines 57-65.

The Applicants thus submit that Lowrey fails to teach or suggest the recitations of Claim 14 and that Claim 14 is thus patentable. In addition, Dependent Claims 24, 26, 27, and 34 are patentable at least as per the patentability of Claim 14 from which they depend.

Dependent Claim 24 Is Separately Patentable Over Lowrey

Claim 24 has been rejected under 35 U.S.C. Sec. 102(e) as being anticipated by Lowrey. The Applicants respectfully submit, however, that Claim 24 is patentable over Lowrey for the reasons discussed above with respect to Claim 14. Claim 24 is also separately patentable for at least the additional reasons discussed below.

As amended, Claim 24 recites “a method according to Claim 14 wherein the pattern of the phase-changeable material extends beyond the first electrode onto

portions of the first insulating layer outside the hole after forming the second electrode.”

In support of the rejection of Claim 24, the Examiner states that Lowrey discloses the pattern of the phase changeable material (18) extending beyond the first electrode (14) onto portions of the first insulating layer (16). More particularly, Lowrey discloses:

Turning next to FIG. 6, deposited in a sequential fashion over the structure shown in FIG. 5 may be the phase change layer 18, barrier layer 20, and fill insulator 22, in one embodiment. [...]

Turning finally to FIG. 7, CMP removes the fill insulator 22, barrier layer 20, and phase change material 18 in all regions above the etch stop layer 24. [...]

As shown in FIG. 1, the structure of FIG. 7 may be covered with a barrier layer 26 and a top electrode 28. (underline added.)

Lowrey, col. 3, lines 17-20, 31-33, and 48-49.


Thus, since Lowrey describes the phase-changeable material layer removed in all regions above the etch stop layer after forming the second electrode, Lowrey fails to teach or suggest a phase-changeable material extending beyond a first electrode onto portions of an insulating layer outside a hole after forming a second electrode, and Claim 24 is therefore separately patentable.

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CONCLUSION

Accordingly, the Applicants submit that all pending claims in the present application are in condition for allowance, and a Notice of Allowance is respectfully requested in due course. The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,

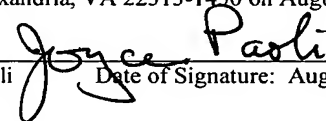


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